The Provisional Double Patenting Rejection

Original claim 10 was rejected under the judicially created doctrine of obviousness-type double patenting as being obvious over claims 13-14 of U.S. Patent No. 6,245,227 (hereinafter sometimes referred to as the "'227 patent").

By way of background, the present application and the '227 patent share an identical specification. However, Kionix filed the application for the '227 patent independently of Advion based upon Kionix's belief that only Kionix employees were inventors of the claims of the '227 patent. The parent of the present divisional application was filed jointly by Advion and Kionix based upon Applicants' belief that employees of each company were inventors. Advion did not know that Kionix had filed the application for the '227 patent at the time of filing. Advion subsequently filed a lawsuit against Kionix and initiated an interference to have inventorship considered with respect to related applications.

Applicants believe the amendment to claim 10 renders the double patenting rejection moot. In the event the Examiner enters a new double patenting rejection over the '227 patent, Applicants suggest that the most reasonable course would be to stay consideration of the merits of any such double patenting rejection pending resolution of the lawsuit and/or interference.

The Anticipation and Obviousness Rejections

Claim 10 was rejected under 35 U.S.C. § 102(b) as being anticipated by WO 97/04297 to Karger et al. ("Karger").

As amended, claim 10 relates to an electrospray device including a monolithic substrate having a plurality of entrance orifices on an injection side and a plurality of nozzles on an ejection surface on an opposite planar side from the injection side, a plurality of channels each extending continuously through the monolithic substrate in communication with one of the plurality of entrance orifices and a corresponding one of the plurality of nozzles, and a region surrounding each nozzle recessed from the ejection surface. The plurality of nozzles are disposed in an array for ejecting a plurality of analytes at a mass spectrometry device interface. The electrospray device also includes a plurality of electrodes for the application of electric potentials for generating and controlling an electric field at each nozzle to direct the ejection of the analytes from the nozzles within an acceptance region of the mass spectrometry device. The electrospray device is formed monolithically from, for

example, a monocrystalline silicone substrate, during the course of and as a result of a fabrication sequence that requires no manipulation or assembly of separate components. This enables the production of a device which is easily reproducible and manufacturable in high volumes. The region surrounding the nozzle recessed from the ejection surface enables the production of a durable nozzle having the physical asperity on which a large electric field may be concentrated. In this manner efficient and controllable electrospray can be achieved.

Karger relates to a microscale fluid handling system having channels etched in the surface of the substrate. The channels are subsequently covered with a separately machined cover plate, thereby defining covered on-substrate channels. The channels may be filled with membrane or packing material to carry out sample manipulations. The end of the channels may be microfabricated to form an electrospray exit port or tip that permits transfer of ions into the sampling orifice of a mass spectrometer by microelectrospray.

Karger discloses the following electrospray exit ports and nozzles: a flat edge-substrate exit port, as shown in Figure 1A; a pointed edge-substrate exit port defined by a sloped recess cut in the substrate between adjacent exit ports, as shown in Figure 1A; a nozzle tip extending outwardly from the surface of a separate cover plate, as shown in Figures 2B, 2C; and a nozzle formed within a recess within a separate cover plate, as shown in Figure 2D.

Claim 10 is directed to a different structure than that taught by Karger. As noted above, Karger discloses channels etched in the surface of the substrate which are covered with a separately machined cover plate, thereby defining covered on-substrate channels. In contrast, claim 10 is, in part, directed to "a plurality of channels each extending continuously through the monolithic substrate in communication with one of the plurality of entrance orifices and a corresponding one of the plurality of nozzles." Providing such a through-substrate channel in a monolithic substrate enables the improved monolithic nozzle design described above that is durable and predictable, and is suitable to mass production.

Further, claim 10 is, in part, directed to a "region surrounding each nozzle recessed from the ejection surface." As noted above, Karger fails to disclose a nozzle surrounded by the claimed recessed region. The presently claimed nozzle design provides the physical asperity required to produce sufficient electric field lines to effectively control the electrospray. Such a nozzle also obviates the fabrication problems associated with attaching tips to the substrate, as disclosed in Karger.

Moreover, for at least the reasons noted above, there is no motivation to modify the electrospray device of Karger to arrive at the present invention absent applicants' disclosure. Since Karger relates to an electrospray device made from separate component parts, there is no motivation to manufacture the device from a monolithic substrate. Further, there is no suggestion how the device of Karger could be fabricated from a monolithic substrate. With respect to the presently claimed nozzle, there is no motivation to modify the many embodiments of the Karger nozzles to arrive at the claimed structure. There is no teaching in Karger of the relationship of nozzle shape to field line generation. Therefore, there is no motivation to extend the recess between exit ports to circumscribe the nozzle in order to provide a nozzle from which electrospray can be reliably controlled.

Applicants believe the present amendments to the specification and claim 10 and their showing of the differences between claim 10 and the teachings and suggestions of the prior art establish the patentability thereof. In the event the Examiner notes any remaining impediment that may be susceptible to resolution via a conference, a telephone call to Applicants' attorney is requested.

Dated this 2nd day of December, 2002.

Respectfully submitted,

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PATENT TRADEMARK OFFICE

Appendix A

Marked-Up Version Showing Changes Made to the Application

In reference to the amendments made herein to the paragraph bridging pages 8 and 9 of the specification and claims 1 and 4, additions appear as underlined text, while deletions appear as bracketed text, as indicated below:

In the Specification:

In all of the above-described devices, edge-spraying from a [monolithic] microchip is a poorly controlled process due to the inability to rigorously and repeatedly determine the physical form of the chip's edge. In another embodiment of edge-spraying, ejection nozzles, such as small segments of drawn capillaries, are separately and individually attached to the chip's edge. This process is inherently cost-inefficient and unreliable, imposes space constraints in chip design, and is therefore unsuitable for manufacturing.

In The Claims:

10. (Amended) An electrospray device comprising:

a monolithic substrate having a plurality of entrance orifices on an injection side and a plurality of nozzles on an ejection surface on an opposite planar side from the injection side, a plurality of channels each extending continuously through the monolithic substrate in communication with one of the plurality of entrance orifices and a corresponding one of the plurality of nozzles, and a region surrounding each nozzle recessed from the ejection surface;

said plurality of nozzles disposed in an array [of nozzles integrated in a substrate] for ejecting a plurality of analytes at a mass spectrometry device interface; and

a plurality of electrodes for the application of electric potentials for generating and controlling an electric field at each nozzle to direct the ejection of the analytes from the nozzles within an acceptance region of the mass spectrometry device.